AN
ACCOUNT
OF THE
LIFE *and* WRITINGS
OF
SR. *ISAAC NEWTON.*

Fr. Le Bouyer de Fontenelle

(15.)

ADVERTISEMENT.

THE *firſt* Edition *of this* Tranſla-*tion was printed in Quarto, in or-der to be bound up with Sir* Iſaac New-ton's *Chronology: But for the benefit of thoſe who cannot afford to purchaſe a Book of ſo high a Price, it was thought neceſ-ſary to publiſh this* Edition, *which it is hoped will not be unacceptable to the Pub-lick, eſpecially ſince it is ſo cheap, and has the ſame Advantage with the former, of being reviſed by the ingenious* Gentleman *who publiſhed the Chronology, and by ſe-veral other Perſons of undoubted Judg-ment and Learning.*

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S^R^. *ISAAC NEWTON.*

Tranſlated from the Eloge *of* M. FONTENELLE,
Secretary of the Academy of Sciences at PARIS.

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AN ACCOUNT OF THE LIFE and WRITINGS OF S^R. ISAAC NEWTON.

SIR Iſaac Newton, who was born at Woolſtrope in the County of Lincoln, on Chriſtmas Day in the Year 1642, deſcended from the elder Branch of the Family of Sir John Newton Baronet. The Manor of Woolſtrope had been in his Family near 200 Years; and the Newtons came thither from Weſtby in the ſame County, but originally from Newton in Lancaſhire. Sir Iſaac's mother, whoſe maiden name was Hannah Aſcough, and who was likewiſe of an ancient family; married again after his Father's death.

When her Son was twelve years old ſhe put him to the Free-ſchool at Grantham; from whence ſhe removed him ſome years after, that he might be accuſtomed betimes to look into his Affairs, and to manage them himſelf. But ſhe found him ſo careleſs of ſuch Buſineſs, and ſo taken up with his Books, that ſhe ſent him again to Grantham, that he might be at liberty to follow his Inclinations; which he farther indulged by going to Trinity college in Cambridge, where he was admitted in 1660, being then eighteen years of age.

In learning Mathematicks he did not ſtudy Euclid, who ſeemed to him too plain and too ſimple, and not worthy of taking up his Time; he underſtood him almoſt before he read, and a caſt of his eye upon the contents of the Theorems was ſufficient to make him maſter of them. He advanced at once to the Geometry of Des Cartes, Kepler's Opticks &c. ſo that we may apply to him what Lucan ſaid of the Nile, whoſe head was not known by the Ancients,

Arcanum Natura caput non prodidit ulli,
Nec licuit populis parvum te, Nile, videre. Luc. l. x.

Nature conceals thy Infant Stream with care,
Nor lets thee, but in Majeſty, appear. Rowe.

It is certain that Sir Iſaac had made his great Diſcoveries in Geometry, and laid the foundation of his too famous pieces the *Principia* and the *Opticks* by the Time that he was twenty four years of age. If thoſe Beings that are ſuperior to Man have likewiſe a progreſſion in Knowledge, they fly whilſt we creep, and leap over thoſe *mediums*, by which we proceed ſlowly and with difficulty from one Truth to another that has a relation to it.

Nicholas Mercator, who was born in Holſtein, but ſpent moſt of his Time in England, publiſhed in 1668 his *Logarithmotechnia*, in which he gave the Quadrature of the Hyperbola by an infinite Series. This was the firſt appearance in the Learned world, of a Series of this ſort, drawn from the particular nature of the Curve, and that in a manner very new and abſtracted. The famous Dr. Barrow, then at Cambridge, where Mr. Newton, who was about 26 years of Age, reſided, recollected that he had met with the ſame thing in the writings of that young gentleman, and there not confined to the Hyperbola only, but extended by general forms to all ſorts of Curves, even ſuch as are mechanical, to their quadratures, their rectifications and their centers of Gravity to the ſolids formed by their rotations, and to the ſuperfices of thoſe ſolids; ſo that ſuppoſing their determinations to be poſſible, the Series ſtopt at a certain point, or at leaſt their ſums were given by ſtated rules: But if the abſolute determinations were impoſſible, they could yet be infinitely approximated which is the happieſt and moſt refined method of ſupplying the defects of Human knowledge that Man's imagination could poſſibly invent. To be maſter of ſo fruitful and general a Theory was a mine of gold to a Geometrician, but it was a greater glory to have been the diſcoverer of ſo ſurprizing and ingenious a ſyſtem. So that Sir Iſaac finding by Mercator's book that he was in the way to it, and that others might follow in his track, ſhould naturally have been forward to open his treaſures, and ſecure the property, which conſiſted in making the diſcovery. But he contented himſelf with the treaſure which he had found, without regarding the glory. He himſelf ſays in a letter of the *Commercium epiſtolicum, That he thought Mercator had entirely diſcovered the ſecret, or that others would diſcover it before he was of an age to write himſelf.* He without any concern ſuffered that to be taken from him, from which he might propoſe to himſelf abundance of glory, and flatter himſelf with the moſt pleaſing expectations. He waited with patience till he was of a fit age to write, or to make himſelf known to the world, though he was already capable of the greateſt things.

His Manuſcript upon the Infinite ſeries was communicated to none but Mr. Collins, and the Lord Brounker, both learned in that way. And even this had not been done, but for Dr. Barrow, who would not ſuffer him to indulge his modeſty ſo much as he deſired.

This Manuſcript was taken out of the Author's ſtudy in the year 1669, entitled, *The method which I formerly found out*, &c. and ſuppoſing this *formerly* to mean no more than three years, he muſt then have diſcovered this admirable Theory of his ſeries when he was not twenty four years of age; but what is ſtill more, this Manuſcript contains both the diſcovery and method of Fluxions, or thoſe *infinitely ſmall quantities*, which have occaſioned ſo great a conteſt between M. Leibnits and him, or rather between Germany and England; of which I have given an Account in 1716, in * the Elogium upon M. Leibnits; and though it was in the Elogium of M. Leibnits, the impartiality of an Hiſtorian was ſo exactly kept

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* p. 109, &c.

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that there now remains nothing new to be ſaid of Sir Iſaac Newton. It was there particularly obſerved *that Sir Iſaac was undoubtedly the Inventor, that his glory was ſecure, and that the only queſtion was, whether M. Leibnits did take this notion from him.* All England is convinced that he did take it from him, though the Royal Society have not declared ſo in their Determination, but only hinted it at moſt. However Sir Iſaac Newton was certainly the firſt Diſcoverer, and that too by many years. M. Leibnits on the other ſide was the firſt that publiſhed the Method, and if he did take it from Sir Iſaac, he at leaſt reſembled Prometheus in the fable, who ſtole fire from the Gods to impart it to Mankind.

In 1687, Sir Iſaac at length reſolved to unveil himſelf and ſhew what he was, and accordingly the *Philoſophiæ Naturalis principia Mathematica* appeared in the world. This book, in which the moſt profound Geometry ſerves for a baſis to a new ſyſtem of Philoſophy, had not at firſt all the reputation which it deſerved, and which it was afterwards to acquire. As it is written with great learning, conceived in few words, and the conſequences often ariſe ſo ſuddenly from their principles, that the Reader is obliged himſelf to ſupply the connection, it required time for the Publick to become 'maſters of it. Conſiderable Geometricians could not underſtand it without great application; and thoſe of a lower claſs undertook it not, 'till they were excited by the applauſe of the moſt skilful, but at length when the book was ſufficiently underſtood, all theſe applauſes which it ſo ſlowly acquired broke out on all ſides, and united in a general admiration. Every body was ſtruck with that original ſpirit that ſhines throughout the whole work, that maſterly genius which in the whole compaſs of the happieſt Age was ſhared only amongſt three or four men picked out from all the moſt learned Nations.

There are two Theories which chiefly prevail in the *Principia*, That of the Central power, and that of the Reſiſtance which mediums make to Motion, both almoſt entirely new, and treated of according to the ſublime Geometry of the Author. We can never touch upon either of theſe ſubjects without having Sir Iſaac before us, without repeating what he has ſaid, or following his track, and if we endeavour'd to diſguiſe it, what skill could prevent Sir Iſaac Newton's appearing in it?

The Relation between the revolutions of the Heavenly bodies and their diſtances from the common center of thoſe revolutions, found out by Kepler, prevails throughout the whole Celeſtial ſyſtem. If we ſuppoſe, as it is neceſſary, that a certain force hinders theſe great bodies from purſuing, above an inſtant, their natural motion in a ſtreight line from Weſt to Eaſt, and continually draws them towards a center; it follows, by Kepler's rule, that this force, which will be central or rather centripetal, will act differently upon the ſame body according to its different diſtances from that center, and this in the reciprocal proportion of the ſquares of thoſe diſtances; that is, for inſtance, if a body be at twice the diſtance from the center of its revolutions, the action of the central force upon it will be four times weaker. It appears that

Sir Iſaac ſet out from hence when he entred upon his phyſicks of the world in general: We may likewiſe ſuppoſe or imagine that he firſt conſidered the Moon, becauſe the Earth is the center of her motion.

If the Moon ſhould loſe all her impulſe or inclination to move from Weſt to Eaſt in a ſtreight line, and if nothing but the central power remained which forces her towards the center of the Earth, ſhe would then only obey that power, only follow its directions, and move in a ſtrait line towards that center. The velocity of her motion being known, Sir Iſaac demonſtrates from that motion that in the firſt minute of her deſcent ſhe would fall 15 Paris feet; her diſtance from the Earth is 60 ſemi-diameters of the Earth, therefore when the Moon comes to the ſurface of the Earth, the action of the force which brought her thither will be encreaſed as the ſquare of 60, that is, it would be 3600 times ſtronger; ſo that the Moon in her laſt minute would fall 3600 times 15 feet.

Now if we ſuppoſe that the force which would have acted upon the Moon is the ſame which we call Gravity in terreſtial bodies, it will follow from the ſyſtem of Galileo that the Moon, which at the ſurface of the Earth would have fallen 3600 times 15 feet in a minute, ſhould likewiſe have fallen 15 feet in the firſt 60th part, or in the firſt ſecond of that minute. Now it is known by all experiments, and they only can be made at ſmall diſtances from the ſurface of the Earth, that heavy bodies fall 15 feet in the firſt ſecond of

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their fall: Therefore as to the velocity of their fall they are exactly in the ſame condition as if having made the ſame revolution round the Earth that the Moon doth and at the ſame diſtance, they ſhould happen to fall by the mere force of their Gravity; and if they are in the ſame condition as the Moon, the Moon is in the ſame condition as they, and is only moved each inſtant towards the Earth by the ſame Gravity. So exact an agreement of effects, or rather this perfect identity can proceed from nothing elſe but the cauſes being the ſame.

It is true that in the ſyſtem of Galileo, which is here followed, the Gravity is equal, and the central force of the Moon is not ſo even in the demonſtration that has juſt been given; but Gravity may well not diſcover its inequality, or rather, it only appears equal in all our experiments, becauſe the greateſt height from which we can obſerve bodies falling is nothing in compariſon of 1500 leagues, the diſtance which they all are from the center of the Earth. It is demonſtrated that a Canon bullet ſhot horizontally deſcribes, in the Hypotheſis of equal Gravity, a parabolic line, terminated at a certain point, where it meets with the Earth, but if it was ſhot from an height conſiderable enough to make inequality of the action of its Gravity perceptible, inſtead of a Parabola it would deſcribe an Ellipſis, of which the center of the Earth would be one of the Foci, that is, it would perform exactly what the Moon doth.

If the Moon hath Gravity like terreſtrial bodies, if ſhe is moved towards the Earth by the ſame power, by which they are moved; if, according to Sir Iſaac's expreſſion, ſhe gravitates towards the Earth, the ſame cauſe acts upon all the reſt of that wonderful concourſe of heavenly bodies; for all nature is one and the ſame, there is every where the ſame diſpoſition, every where Ellipſes will be deſcribed by bodies, whoſe motions are directed to a body placed in one of their Foci. The Satellites of Jupiter will gravitate towards Jupiter, as the Moon gravitates towards the Earth; the Satellites of Saturn towards Saturn, and all the Planets together towards the Sun.

It is not known in what Gravity conſiſts. Sir Iſaac Newton himſelf was ignorant of it. If Gravity acts only by impulſe, we may conceive that a block of marble falling, may be puſhed towards the Earth, without the Earth being in any manner puſhed towards it; and in a word all the centers to which the motions cauſed by Gravity have relation, may be immoveable. But if it acts by Attraction the Earth cannot draw the block of marble, unleſs the block of marble likewiſe draw the Earth, why then ſhould that attractive power be in ſome bodies rather than others? Sir Iſaac always ſuppoſes the action of Gravity in all bodies to be reciprocal and in proportion only to their bulk; and by that ſeems to determine Gravity to be really an attraction. He all along makes uſe of this word to expreſs the active power of bodies, a power indeed unknown, and which he does not take upon him to explain; but if it can likewiſe act by Impulſe, why ſhould not that clearer term have the preference? for it muſt be agreed that it is by no means poſſible to make uſe of them both indifferently, ſince they are ſo oppoſite. The continual uſe of the word Attraction ſupported by great authority, and perhaps too by the inclination which Sir Iſaac is thought to have had for the thing itſelf, at leaſt makes the Reader familiar with a notion exploded by the Carteſians, and whoſe condemnation had been ratified by all the reſt of the Philoſophers; and we muſt now be upon our guard, leſt we imagine that there is any reality in it, and ſo expoſe our ſelves to the danger of believing that we comprehend it.

However all bodies according to Sir Iſaac gravitate towards each other, or attract each other in proportion to their Bulk: and when they revolve about a common center, by which conſequently they are attracted, and which they attract, their attractive powers are in the reciprocal proportion of their Diſtances from that center, and if all of them together with their common center revolve round another center common to them, and to others, this will again produce new proportions, which will become ſtrangely complex. Thus each of the five Satellites of Saturn gravitate towards the other four, and the other four gravitate towards it; all the five gravitate towards Saturn, and Saturn towards them; all together gravitate towards the Sun, and the Sun again towards them. What an excellent Geometrician muſt he have been to ſeparate ſuch a Chaos of relations! the very undertaking ſeems raſhneſs; and we cannot without aſtoniſhment conceive that from ſo abſtracted a Theory, compoſed of ſo many ſeparate Theories, all very difficult to handle, ſuch neceſſary concluſions ſhould ariſe, and all comformable to the approved axioms of Aſtronomy.

Sometimes theſe concluſions even foretel events, which the Aſtronomers themſelves had not remarked. It is aſſerted, and more eſpecially in England, that when Jupiter and Saturn are neareſt, which is at 165 millions of leagues diſtance, their motions have no longer the ſame regularity as in the reſt of their courſe; and the Syſtem of Sir Iſaac at once accounts for it, which cannot be done by any other Syſtem. Jupiter and Saturn attract each other with greater force, becauſe they are nearer; and by this means the regularity of the reſt of their courſe is very ſenſibly diſordered; nay, they go farther ſtill, and determine the quantity and the bounds of this irregularity.

The motion of the Moon is the leaſt regular of any of the Planets, the moſt exact tables are ſometimes wrong, and ſhe makes certain excurſions which could not before be accounted for. Dr. Halley, whoſe profound skill in mathematicks has not hindered his being a good Poet, ſays in the Latin verſes prefixt to the *Principia*,

Diſcimus hinc tandem qua cauſa argentea Phœbe
Paſſibus haud æquis graditur; cur ſudita nulli
Hactenus Aſtronomo numerorum frena recuſet.

That the Moon till then never ſubmitted to the bridle of calculations, nor was ever broke by any Aſtronomer; but that at laſt ſhe is ſubdued in this new Syſtem. All the irregularities of her courſe are there ſhewn to proceed from a neceſſity by which they are foretold. It is difficult to imagine that a Syſtem in which they take this form ſhould be no more than a lucky conjecture; eſpecially if we conſider this but as a ſmall part of a Theory, which with the ſame ſucceſs comprehends an infinite number of other ſolutions. The ebbing and flowing of the Tyde ſo naturally ſhews it ſelf to proceed from the operation of the Moon upon the Sea, combined with that of the Sun, that the admiration which this phenomenon uſed to raiſe in us ſeems to be leſſened by it.

The ſecond of theſe two great Theories, upon which the *Principia* chiefly runs, is that of the Reſiſtance of *mediums* to motion, which muſt enter into the conſideration of all the chief phenomena of Nature, ſuch as the motions of the celeſtial bodies, of Light and Sound. Sir Iſaac, according to his uſual method, lays his foundations in the moſt ſolid proofs of Geometry, he conſiders all the cauſes from which reſiſtance can poſſibly ariſe; the denſity of the medium, the ſwift motion of the body moved, the magnitude of its ſuperfices, and from thence he at laſt draws concluſions which deſtroy all the Vortices of Des Cartes, and overturn that immenſe celeſtial edifice, which we might have thought immoveable. If the Planets move round the Sun in a certain medium whatever it be, in an ætherial matter which fills up the whole, and which notwithſtanding its being extreamly ſubtil, will yet cauſe reſiſtance as is demonſtrated, whence comes it then that the motions of the Planets are not perpetually, nay inſtantly leſſened? but beſides this, how can Comets traverſe thoſe Vortices freely every way, ſometimes with a tendency abſolutely oppoſite to theirs, without receiving any ſenſible alteration in their motions, tho' of never ſo long a continuance? whence comes it that theſe immenſe torrents whirling round with almoſt incredible velocity, do not inſtantly deſtroy the particular motion of any body, which is but an atom in compariſon of them, and why do they not force it to follow their courſe? The Celeſtial Bodies do then move in a vaſt vacuum, unleſs their exhalations and the rays of Light which together form a thouſand different mixtures, ſhould mingle a ſmall quantity of matter with the almoſt infinite material ſpaces. Thus Attraction and Vacuum baniſh'd from Phyſicks by Des Cartes, and in all appearance for ever, are now brought back again by Sir Iſaac Newton, armed with a power entirely new, of which they were thought incapable, and only perhaps a little diſguiſed.

Theſe two great men, whoſe Syſtems are ſo oppoſite reſembled each other in ſeveral reſpects, they were both Genius's of the firſt rank, both born with ſuperior underſtandings, and fitted for the founding of Empires in Knowledge. Being excellent Geometricians, they both ſaw the neceſſity of introducing Geometry into Phyſicks; For both founded their Phyſicks upon diſcoveries in Geometry, which may almoſt be ſaid of none but themſelves. But one of them taking a bold flight, thought at once to reach the Fountain of All things, and by clear and fundamental ideas to make himſelf maſter of the firſt principles; that he might have nothing more left to do, but to deſcend to the phenomena of Natures as to neceſſary conſequences; the other more cautious, or rather more modeſt, began by taking hold of the known phenomena to climb to unknown principles; reſolved to admit them only in ſuch manner as they could be produced by a chain of conſequences. The former ſets out from what he clearly underſtands, to find out the cauſes of what he ſees; the latter ſets out from what he ſees, in order to find out the cauſe, whether it be clear or obſcure. The ſelf-evident principles of the one do not always lead him to the cauſes of the phenomena as they are; and the phenomena do not always lead the other to principles ſufficiently evident. The boundaries which ſtop'd two ſuch men in their purſuits through different roads were not the boundaries of their Underſtanding, but of Human underſtanding it ſelf.

While Sir Iſaac was compoſing his great work, the *Principia*, he had alſo another in hand, as much an original and as new; which tho' by the title it did not ſeem ſo general, is yet as extenſive by the manner in which he has treated that particular ſubject. *This work* was his *Opticks, or treatiſe of Light and Colours*, which firſt appeared in the year 1704, after he had been making the neceſſary experiments for thirty years together.

It is no ſmall art to make experiments exactly. Every matter of Fact which offers it ſelf to our conſideration is complicated with ſo many others, which either compound or modify it, that without abundance of skill they cannot be ſeparated; nay without an extraordinary ſagacity, the different elements that enter into the compoſition can hardly be gueſſed at. The fact therefore to be conſidered muſt be reſolved into the different ones of which it is compoſed; and they themſelves are perhaps compoſed of others; ſo that if we have not choſen the right road, we may ſometimes be engaged in endleſs Labyrinths. The Principles and Elements of things ſeem to have been conceal'd from us by Nature, with as much care as the Cauſes, and when we attain to the diſcovery of them, it is a Sight entirely new and unexpected.

What Sir Iſaac Newton aims at quite through his *Opticks*, is the Anatomy of Light; this expreſſion is not too bold ſince it is no more than the thing it ſelf, By his experiments the ſmalleſt ray of Light that is convey'd into a dark room, and which cannot be ſo ſmall, but that it is yet compounded of an infinite number of other rays, is divided and diſſected in ſuch manner, that the Elementary rays of which it is compoſed, are ſeparated from each other, and diſcover themſelves every one tinged with its particular colour, which after this ſeparation can no more be altered. The firſt total ray before the diſſection, is white, and this whiteneſs aroſe from all the particular colours of the Primitive rays. The ſeparating theſe rays is ſo difficult, that when Mariotte undertook it upon the firſt news of Sir Iſaac's experiments, he miſcarried in the attempt, even he who had ſuch a genius for experiments, and had been ſo ſucceſsful on many other ſubjects.

No primitive coloured rays could be ſeparated, unleſs they were ſuch by their nature, that in paſſing through the ſame medium, or through the ſame glaſs priſm, they are refracted at different angles, and by that means ſeparate when they are received at proper diſtances. This different Refrangibility of rays, red, yellow, green, blue, purple, and all other colours infinite in number, a property which was never before ſuſpected, and to which we could hardly be led by conjecture, is the fundamental diſcovery of Sir Iſaac Newton's treatiſe. The different Refrangibility leads us to the different Reflexibility. But there is ſomething more; for the rays which fall at the ſame angle upon a ſurface are refracted and reflected alternately, with a kind of play only diſtinguiſhable to a quick eye, and well aſſiſted by the judgment of the Obſerver. The only point, the firſt idea of which does not entirely belong to Sir Iſaac Newton, is, that the rays which paſs near the extremities of a body, without touching it, do ſomewhat turn from a ſtrait line, which is called Inflection. But the whole together forms a body of Opticks ſo perfectly new, that we may henceforward look upon that ſcience as almoſt wholly owing to this Author.

That he might not confine himſelf to theſe bare ſpeculations, which are ſometimes unjuſtly ſtyled idle, he gave us the deſign of a Teleſcope by reflection, which was not thoroughly put in execution 'till a long time after. It has here been experienc'd that one of theſe Teleſcopes but 2 foot and a half long, had as good an * effect as a tolerable common Teleſcope of 8 or 9 feet, which is a very extraordinary advantage, and the whole improvement

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* **N. B.** *By accurate tryals made here, a reflecting Teleſcope of* 2 *foot and a half, hath been found no ways inferior to one of the common ſort, of between* 40 *and* 50 *foot long.*

provement of it will probably be better known hereafter.

One advantage of this book, equal perhaps to that of the many new diſcoveries with which it abounds, is that it furniſhes us with an excellent model of proceeding in Experimental Philoſophy. When we are for prying into Nature, we ought to examine her like Sir Iſaac, that is, in as accurate and importunate a manner. Things that almoſt hide themſelves from our enquiries, as being of two abſtracted a nature, he knows how to reduce to calculation, tho' ſuch calculations might elude the Skill of the beſt Geometricians, without that Dexterity which was peculiar to himſelf; and the uſe which he makes of his Geometry, is as artful as the Geometry it ſelf is ſublime.

He did not finiſh his *Opticks*, becauſe ſeveral neceſſary experiments had been interrupted, and he could not begin them again. The parts of this building, which he left unfiniſhed, could by no means be carried on but by as able hands as thoſe of the firſt Architect: However he hath put ſuch who are inclined to carry on this work in a proper method, and even chalks out to them a way to proceed from Opticks, to a compleat body of Phyſicks, under the form of *Doubts*, or *Queries* propoſing a great many deſigns which will help future Philoſophers, or which at leaſt will make a curious hiſtory of the Conjectures of a great Philoſopher.

Attraction is the governing principle in this ſhort plan of Phyſicks; that property which is called the *Hardneſs* of bodies, is the mutual attraction of their parts, which cloſes them together, and if they are of ſuch a figure as that whole ſurfaces are capable of being every where joyned, without leaving any void ſpaces, the bodies are then perfectly hard. Of this kind there are only certain ſmall bodies which are primitive and unalterable, and which are the elements of all other bodies. *Fermentations*, or chimical *Efferveſcences*, whoſe motion is ſo violent, that they may ſometimes be compared to ſtorms, are the effects of this powerful attraction, which acts upon ſmall bodies only at ſmall diſtances.

He conceives in general, that Attraction is the active principle of every thing in Nature, and the cauſe of all motion. If a certain degree of motion that is once given to any thing by the hand of God, did afterwards only diſtribute it ſelf according to the laws of Percuſſions, it appears that it would continually decreaſe in its motion by contrary Percuſſions, without ever being able to recover itſelf, and the Univerſe would very ſoon fall into ſuch a ſtate of reſt, as would prove the deſtruction of the whole. The power of Attraction, which always ſubſiſts and is not weakned by being exerted, is a perpetual ſpring of action and life. It may likewiſe happen that the effects of this power may at length combine in ſuch a manner, as that the Syſtem of the Univerſe may be diſordered, and require, according to Sir Iſaac's expreſſion, *a hand to repair it.*

He declares very freely that he lays down this Attraction, only as a cauſe which he knows not, and whoſe effects he only conſiders, compares and calculates; and in order to avoid the reproach of reviving the Occult qualities of the Schoolmen, he ſays, that he eſtabliſhes none but ſuch Qualities as are *manifeſt* and very viſible by their phenomena, but that the cauſes of theſe Qualities are indeed *occult*, and that he leaves it to other Philoſophers to ſearch into them; but are they not properly cauſes which the Schoolmen call *Occult qualities*; ſince their effects are plainly ſeen? beſides, could Sir Iſaac think that others would find out theſe *Occult cauſes* which he could not diſcover? with what hopes of ſucceſs can any other man ſearch after them?

At the end of his Opticks he put two Treatiſes of pure Geometry, one concerning the *Quadrature of Curves* and the other of the *Enumeration of Lines*, which he ſtyles of the *third order*; he hath ſince left them out, becauſe the ſubject was too different from that of the Opticks, and they were printed ſeparately in 1711, with an *Analyſis by Infinite equations* and the *Differential method*. It would be only repetition to ſay, that throughout all his works there appears a refined ſort of Geometry that is peculiar to himſelf.

Being ſo taken up with theſe Speculations, he ſhould naturally ſeem to have had no inclination to Buſineſs, and to have been incapable of it; but yet when the privileges of the univerſity of Cambridge, where he had been Mathematical Profeſſor from 1669, by Dr. Barrow's reſignation to him, were attackt by King James II. in 1687, (in which year he publiſhed the *Principia*) he was very zealous in aſſerting them, and the Univerſity named him one of the Delegates to the *High Commiſſion* court. He was likewiſe one of their Repreſentatives in the Convention-Parliament of 1688, and ſate in it 'till it was diſſolved.

In 1696 the Earl of Hallifax, who was Chancellor of the Exchequer and a great patron to learned men; (for the Engliſh Nobility do not think it a point of honour to ſlight them, but are frequently ſuch themſelves) obtained from King William the office of *Warden of the Mint* for Sir Iſaac Newton; and in this employment he was very ſervicable in the great re-coynage at that time. Three years after he was made *Maſter and Worker*, a place of conſiderable profit which he enjoyed till his death.

It may be thought that this place in the Mint was ſuitable to him only becauſe he was an excellent Geometrician and had great skill in Phyſicks; and indeed this buſineſs often requires very difficult Calculations, and a great number of Chimical experiments, of his skill in which there are many proofs in his *Table of the Eſſays of foreign Coins* printed at the End of Dr. Arbuthnot's book. But his genius extended likewiſe to matters merely political, and in which there was no mixture of Speculative ſciences; for upon the calling of the Parliament in 1701, he was again choſen Repreſentative for the Univerſity of Cambridge. After all, it is perhaps an error to look upon the Sciences and Buſineſs as incompatible, eſpecially to Men of a certain turn. Political Affairs, when well underſtood, are naturally reduced to refined Calculations, and have ſo near an affinity, that thoſe who are uſed to ſublime ſpeculations comprehend them with greater facility and more certainty, as ſoon as they are acquainted with the facts, and furniſhed with proper materials.

It was Sir Iſaac Newton's peculiar happineſs, to enjoy the reward of his merit in his life-time, quite contrary to Des Cartes, who did not receive any honours 'till after his death. The Engliſh do not reſpect great Genius's the leſs for being born amongſt them; and ſo far are they from endeavouring to depreciate them by malicious criticiſms, ſo far from approving the Envy which attacks them, that they all conſpire to raiſe them; and that great degree of Liberty which occaſions their differences in the moſt important points, does not hinder them from uniting in this. They are all very ſenſible how much the glory of the *Underſtanding* ſhould be valued in a State, and whoever can procure it to their Country becomes extremely dear to them. All the learned Men of a Nation, which produces ſo many, placed Sir Iſaac at their head by a kind of unanimous applauſe, they acknowledged him for their Chief and their Maſter: not ſo much as one oppoſer durſt appear, nay they would not even have admitted of a moderate admirer. His Philoſophy hath been adopted throughout England, it prevails in the Royal Society, and in all the excellent performances which have come from thence; as if it had been already made ſacred by the reſpect of a long ſeries of ages. In ſhort He was reverenced to ſo great a degree that death could not procure him new honours, and he himſelf ſaw his own *Apotheoſis.* Tacitus who has reproach'd the Romans with their extream indifference for the great men of their Nation, would certainly have given the Engliſh the quite contrary Character. In vain would the Romans have excuſed themſelves by pretending that great merit was no more than what was common amongſt them. Tacitus would have told them that it never was ſo, or that we ſhould even endeavour to make it ſo by the honour we annex to it.

In 1703, Sir Iſaac Newton was choſen Preſident of the Royal Society, and continued ſo without any interruption 'till the time of his death, for the ſpace of 23 years; a ſingular example, and one from which they could fear no ill conſequences hereafter. Queen Anne Knighted him in 1705, a title of honour which at leaſt ſerves to ſhew that his name had reached the Throne, to which the moſt celebrated names do not always arrive.

He was more known than ever in the court of the late King. The Princeſs of Wales, who is now Queen of Great Britain, has ſo excellent an underſtanding and ſo much knowledge that ſhe was capable of asking queſtions of ſo great a Man, and could receive ſatisfactory anſwers from none but himſelf. She has often declared publickly that ſhe thought it an happineſs to live in his time and to be acquainted with him. In how many other Ages, in how many other Nations might he have been placed without meeting with ſuch another Princeſs.

He had compoſed a treatiſe of Ancient Chronology, which he had no thoughts of publiſhing, but that Princeſs, to whom he imparted ſome of the chief points, thought them ſo new, and ſo full of Art, that ſhe deſired a ſummary of the whole Work, which ſhe never would part with, and would be alone in poſſeſſion of; and She ſtill keeps it amongſt her choiceſt Treaſures. However there eſcaped a copy of it: Curioſity excited by ſuch a particular piece of Sir Iſaac Newton could hardly be hindred from employing the utmoſt addreſs to come at ſo great a Treaſure; and in truth they muſt have been very ſevere who would have condemned ſuch a curioſity. This Copy was brought into France, by the perſon who was ſo happy as to procure it, and the value which he had for it hindred his being very careful of it; ſo that it was ſeen, tranſlated, and at length printed.

The main deſign of this Syſtem of Chronology of Sir Iſaac, as appears by the extract we have of it, is to find out by following with abundance of Sagacity ſome of the tracks, however faint they are, of the moſt ancient Greek Aſtronomy, what was the poſition of the Colure of the Equinoxes with reſpect to the Fix'd ſtars, in the time of Chiron the Centaur. As it is now known that theſe Stars have a motion in longitude of one degree in 72 years, if it is once known that in Chiron's time the Colure paſſed through certain Fix'd ſtars, it may be known by taking their diſtance from thoſe, through which it now paſſes, how much time hath elapſed from Chiron until our days. Chiron was one of thoſe who went along with the Argonauts in their famous expedition; this would therefore fix the Epocha of that expedition, and conſequently afterwards that of the Trojan War: Two great Events upon which all ancient Chronology depends. Sir Iſaac places them 500 years nearer the Chriſtian Æra than they are uſually placed by other Chronologers.

This Syſtem has been attackt by two learned Frenchmen; who were blamed in England for not having ſtaid for the whole work and with having been ſo haſty in their Criticiſm. But is not this their earneſtneſs an Honour to Sir Iſaac? they ſeized as ſoon as poſſible the glory of having ſuch an adverſary; and they are like to find others in his ſtead: For the famous Dr. Halley, chief Aſtronomer to the King of Great Britain, has already written in the defence of the Aſtronomical part of the Syſtem; and his friendſhip for the great man deceaſed, as well as his great skill in this Science make him a formidable adverſary. But after all, the conteſt is not determined; the Publick, ſuch I mean as are capable of judging of it, and who are but few in number, have not yet done it, and though it ſhould happen that the ſtrongeſt arguments were on one ſide, and only Sir Iſaac's name on the other, perhaps the World would remain ſome time in ſuſpence, and perhaps too with good reaſon.

As ſoon as the Academy of Sciences, by their Regulation in 1699, could chuſe Foreigners into the number of their Aſſociates, they failed not to make Sir Iſaac Newton one of them. He all along held correſpondence with them, by ſending them whatever he publiſhed. This was ſome of his former works which he either cauſed to be reprinted, or which he now firſt publiſhed. But after he was employed in the Mint where he had now been for ſome time, he engaged himſelf no more in any conſiderable new undertaking either in Mathematicks or Philoſophy. For tho' his ſolution of the famous problem of the *Trajectoriæ* propoſed to the Engliſh by way of challenge by M. Leibnits during his conteſt with them, and which was much ſought after both for the perplexity and difficulty of it, may be reckon'd a conſiderable attempt, it was hardly more than diverſion to Sir Iſaac Newton. He received this problem at four of the Clock in the afternoon, at his return from the Mint very much fatigued, and never went to bed 'till he had maſtered it.

After having been ſo ſerviceable to all the learned part of Europe in Speculative Sciences, he devoted himſelf entirely to the ſervice of his Country in affairs that were more viſibly and directly advantageous to it, a ſenſible pleaſure to every good ſubject; but all his leiſure time he devoted to the curioſity of his mind; he thought no kind of knowledge beneath his conſideration, and he knew how to improve himſelf by every thing. After his death there were found amongſt his papers ſeveral writings, upon Antiquity, Hiſtory, and even Divinity it ſelf, which is ſo widely different from thoſe Sciences, for which he is ſo much diſtinguiſhed. He never ſuffered a moment to paſs unemployed, and he never ſpent his time after a trifling manner, or with ſlight attention to what he was about.

He all along enjoyed a ſettled and equal ſtate of health until he was fourſcore years old; a very eſſential circumſtance of the extraordinary happineſs which he enjoyed. He then began to be afflicted with an Incontinence of Urine, and yet the five years following which preceded his death, he enjoyed long intervals of health, or was tolerably well by means of the regularity of his diet, or by taking that care of himſelf which he had hitherto had no occaſion for. He was then forced to rely upon Mr. Conduit, who had married his Neice, to manage his buſineſs at the Mint; which he had not done but that he was very confident that he repoſed a truſt that was of ſo important and delicate a nature, in good hands; and his opinion has been confirmed ſince his death by the choice of the King, who has given that employment to Mr. Conduit. Sir Iſaac Newton did not undergo much pain till the laſt twenty days of his life, when it was thought that he certainly had the Stone in his bladder, and that he could not recover. In theſe fits of pain, which were ſo violent that drops of ſweat fell from his face, he never cried out, nor expreſſed the leaſt impatience; and as ſoon as he had a moment's eaſe, he ſmiled, and ſpoke with his uſual cheerfulneſs. Till that time he had always read and writ ſeveral hours every day. He read the News Papers on Saturday morning the eighteenth of March, and talked a great while with the famous phyſician Dr. Mead, and perfectly enjoyed all his ſenſes and his underſtanding, but at night he entirely loſt all manner of ſenſe, and never recovered it again; as if the Faculties of his Soul were ſubject only to be totally extinguiſhed, and not to be leſſened by degrees. He died on the Monday following the twentieth of March, being in the Eighth-fifth year of his Age.

His Corps was laid in ſtate in the Jeruſalem Chamber, from whence perſons of the greateſt Quality and ſometimes Crowned heads are carried to their grave. He was buried in Weſtminſter Abby, his pall being held up by the Lord Chancellor, the Dukes of Montroſe and Roxburgh, and by the Earls of Pembroke, Suſſex and Macclesfield. By theſe ſix peers of England you may eaſily judge how many perſons of diſtinction attended his funeral. The Biſhop of Rocheſter (as Dean of Weſtminſter) performed the ſervice, attended by all the Clergy belonging to the Abby, and the body was interred juſt at the entrance into the choire. We muſt look back to the Ancient Greeks if we would find out examples of ſo extraordinary a veneration for learning. His family imitate the Grecians as near as poſſible by a monument which they intend to erect for him, and which will coſt a conſiderable ſum of money; and the Dean and Chapter of Weſtminſter have allowed it to be erected in a place in the Abby, which hath often been refuſed to Nobility of the firſt rank. Both his Country and Family were as remarkable in expreſſing their grateful reſpect towards him; as if by voluntary choice he had made them his.

He was of a middle ſtature, ſomewhat inclined to be fat in the latter part of his life; he had a very lively and piercing eye; his countenance was pleaſing and venerable at the ſame time, eſpecially when he pulled off his peruke and ſhewed his white head of hair that was very thick. He never made uſe of ſpectacles, and loſt but one tooth in all his life. His name is a ſufficient excuſe for our giving an account of theſe minute circumſtances.

He was born with a very meek diſpoſition, and an inclination for quietneſs. He could rather have choſen to have remained in obſcurity, than to have the calm of his life diſturbed by thoſe ſtorms of Literature, which Wit and Learning brings upon thoſe who ſet too great a value upon themſelves. We find by one of his letters in the *Commercium Epiſtolicum*, that his Treatiſe of Opticks being ready for the preſs, certain unſeaſonable objections which happened to ariſe made him lay aſide this deſign at that time. *I upbraided my ſelf*, ſays he, *with my imprudence, in loſing ſuch a reality as quiet in order to run after a ſhadow*. But this ſhadow did not eſcape him in the concluſion; it did not coſt him his quiet which he ſo much valued, and it proved as much a reality to him as that quiet it ſelf.

A meek diſpoſition naturally promiſes Modeſty; and it is affirmed that his was always preſerved without any alteration, tho' the whole world conſpired againſt it. He never talked of himſelf, or with contempt of others, and never gave any reaſon even to the moſt malicious obſervers to ſuſpect him of the leaſt notion of Vanity. In truth he had little need of the trouble and pains of commending himſelf; but how many others are there who would not have omitted that part, which men ſo willingly take upon themſelves, and do not care to truſt with others? How many great men who are univerſally eſteemed, have ſpoiled the concert of their praiſe, by mixing their own voices in it!

He had a natural plainneſs and affability, and always put himſelf upon a level with every body. Genius's of the firſt rank never deſpiſe thoſe who are beneath them, whilſt others contemn even what is above them. He did not think himſelf diſpenſed with, either by his merit, or reputation, from any of the ordinary duties of Life; he had no Singularity either natural or affected, and when it was requiſite he knew how to become a common man.

Tho' he was of the Church of England, he was not for perſecuting the Non-conformiſts in order to bring them over to it. He judged of Men by their manners, and the true Non-conformiſts with him were the vicious and the wicked. Not that he relied only on natural religion, for he was perſuaded of Revelation; and amongſt the various kind of books which he had always in his hands, he read none ſo conſtantly as the Bible.

The Plenty which he enjoyed, both by his Paternal eſtate, and by his Employments, being ſtill increaſed by the wiſe ſimplicity of his manner of living, gave him opportunities of doing good, which were not neglected. He did not think that giving by his laſt Will, was indeed giving; ſo that he left no Will; and he ſtript himſelf whenever he perform'd any act of generoſity, either to his Relations or to thoſe whom he thought in want. And the good actions which he did in both capacities were neither few nor inconſiderable. When decency required him upon certain occaſions to be expenſive and make a ſhew, he was magnificent with unconcern, and after a very graceful manner. At other times all this pomp, which ſeems conſiderable to none but people of a low genius, was laid aſide, and the expence reſerved for more important occaſions. It would really have been a prodigy, for a mind uſed to Reflection and as it were fed with Reaſoning, to be at the ſame time fond of this Vain magnificence.

He never married, and perhaps he never had leiſure to think of it; being immerſed in profound and continual ſtudies during the prime of his age, and afterwards engaged in an Employment of great importance, and his intenſe application never ſuffer'd him to be ſenſible of any void ſpace in his life, or of his having occaſion for domeſtick ſociety.

He left behind him about 32000 pounds Sterling. M. Leibnits, his rival, likewiſe died in good Circumſtances, tho' not ſo rich: But he left a conſiderable ſum of money which he had hoarded up. * Theſe two extraordinary examples, and both of Strangers, ſeemed to deſerve our remembrance.

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* V. L'Hiſt. 1716. p. 128.

FINIS.